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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/591,781	06/12/2000	Sing Bing Kang	MCS-033-00	5214

27662 7590 04/14/2004

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EXAMINER	
LONG, HEATHER R	

ART UNIT	PAPER NUMBER
2615	6

DATE MAILED: 04/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/591,781	KANG, SING BING	
	Examiner	Art Unit	
	Heather R Long	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 June 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 June 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: Fig. 3, reference sign "330". A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities:

a. Page 6, line 18: change "drive 128" to –drive 118--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawhney et al. (U.S. Patent 6,571,024) in view of Driscoll Jr. (U.S. Patent Application Publication 2001/0010555).

Regarding claim **1**, Sawhney et al. discloses a method of self-calibration for a omni-directional camera, comprising: capturing a sequence of omni-directional images; tracking a feature across the sequence of omni-directional images; defining an objective function as an error between an actual feature location and a predicted feature location; and optimizing the objective function to obtain a set of calibration parameters for the omni-directional camera (Fig. 18; col. 4, lines 56-63; col. 11, lines 5-13). However, Sawhney does not disclose how the omni-directional images are being taken.

Referring to the Driscoll Jr. reference, Driscoll Jr. discloses an omni-directional camera comprising a reflecting surface and a lens (paragraph [0039]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have combined the teachings of Driscoll Jr. with Sawhney et al. because Sawhney et al. discloses a camera capable of taking multi-view images and one of the ways of doing that is using a camera with a reflecting surface and a lens as disclosed by Driscoll Jr.

Regarding claim **2**, Sawhney et al. discloses a method, wherein the feature is at least one of: (a) a point; (b) a line; (c) a plane (col. 4, lines 46-48 and 56-59).

Regarding claim **3**, Sawhney et al. discloses a method, wherein tracking a feature includes tracking point features within a pair of images contained in the sequence of omni-directional images (Fig. 18; col. 4, lines 56-63).

Regarding claim **4**, Sawhney et al. disclose a method, further comprising identifying pairwise correspondence of tracked features (col. 4, lines 56-63).

Regarding claim **5**, Sawhney et al. discloses a method, wherein defining the objective function includes finding a deviation form epipolar geometry for the identified pairwise tracked features (col. 4, lines 34-44).

Regarding claim **6**, Sawhney et al. in view of Driscoll Jr. discloses a method, wherein the objective function is defined based on characteristics of catadioptric imaging to relate tracked features to the set of calibration parameters (Sawhney et al.: Fig. 18; col. 11, lines 13-32).

Regarding claim **7**, Sawhney et al. discloses a method, wherein the objective function includes an error metric and optimizing the objective function includes minimizing the error metric (Fig. 18; col. 11, lines 5-13).

Regarding claim **8**, Sawhney et al. discloses a method, wherein the error metric is an algebraic error metric (col. 6, lines 45-50).

Regarding claim **9**, Sawhney et al. discloses a method, wherein the error metric is an image error metric (col. 5, lines 32-36).

Regarding claim **10**, Sawhney et al. discloses a method, wherein the set of calibration parameters includes at least one of: (a) principal point; (b) mirror shape parameter; (c) an aspect ratio; (d) an image skew (col. 5, lines 49-55).

Regarding claim **11**, Sawhney et al. discloses in Fig. 1a computer-readable medium having computer-executable instructions for performing the steps recited in claim 1 (col. 3, lines 14-37).

Regarding claim **12**, Sawhney et al. discloses a method of self-calibration for a omni-directional camera, comprising: obtaining a sequence of omni-directional images of a scene from a omni-directional camera; tracking features within the scene across the sequence of omni-directional images; characterizing epipolar geometry based on an initial set of calibration parameters; defining an objective function as a deviation from the epipolar geometry for the tracked features; and minimizing the objective function to obtain calibration parameters (Fig. 18; col. 4, lines 29-63; col. 11, lines 5-13). However, Sawhney does not disclose how the omni-directional images are being taken.

Referring to the Driscoll Jr. reference, Driscoll Jr. discloses an omni-directional camera comprising a reflecting surface and a lens (paragraph [0039]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have combined the teachings of Driscoll Jr. with Sawhney et al. because Sawhney et al. discloses a camera capable of taking multi-view images and one of the ways of doing that is using a camera with a reflecting surface and a lens as disclosed by Driscoll Jr.

Regarding claim **13**, Sawhney et al. in view of Driscoll Jr. discloses a method, further comprising reformulating a projection equation to allow analyses to be applied in the same manner as for a rectilinear image sequence (Sawhney et al.: Fig. 18; col. 11, lines 13-32; Driscoll Jr.: paragraphs [0078] - [0087]).

Regarding claim **14**, Sawhney discloses a method, wherein the objective function includes an error metric that is defined in terms of the deviation of

pairwise tracked feature correspondences from the epipolar geometry (col. 4, lines 29-63).

Regarding claim **15**, Sawhney discloses a method, wherein the error metric is at least one of: (a) an algebraic error metric; (b) an image-based error metric (col. 5, lines 32-36).

Regarding claim **16**, Sawhney discloses a method, wherein the image-based error metric defines an image distance to an epipolar curve (col. 4, lines 29-44).

Regarding claim **17**, Sawhney discloses a method, wherein minimizing the objective function further comprises using an optimization technique to minimize the error metric (Fig. 18; col. 11, lines 5-13).

Regarding claim **18**, Sawhney et al. discloses a method for obtaining optimal calibration parameters to calibrate a camera system, comprising: tracking features across an image sequence captured by the camera system; identifying pairwise correspondence between the tracked features; defining an objective function in terms of an error metric based deviation from epipolar geometry for the pairwise tracked features; and minimizing the error metric to minimize the objective function and obtain the optimal calibration parameters (Fig. 18; col. 4, lines 56-63; col. 11, lines 5-13). However, Sawhney does not disclose what kind of camera system is being used or what kind of camera is capable of omni-directional pictures.

Referring to the Driscoll Jr. reference, Driscoll Jr. discloses an omni-directional camera comprising a reflecting surface and a lens (paragraph [0039]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have combined the teachings of Driscoll Jr. with Sawhney et al. because Sawhney et al. discloses a camera capable of taking multi-view images and one of the ways of doing that is using a camera with a reflecting surface and a lens as disclosed by Driscoll Jr.

Regarding claim **19**, Sawhney et al. in view of Driscoll Jr. discloses a method, further comprising reformulating a projection equation to permit analysis subsequent to obtaining the optimal calibration parameters to be applied in the same manner as for a rectilinear image sequence (Sawhney et al.: Fig. 18; col. 11, lines 13-32; Driscoll Jr.: paragraphs [0078] - [0087]).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Heather R Long whose telephone number is 703-305-0681. The examiner can normally be reached on Mon. - Thurs: 7:00 am - 4:30 pm, and every other Fri.: 7:00 am - 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Christensen can be reached on (703) 308-9644. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HRL
April 12, 2004

NGOC-YEN VU
PRIMARY EXAMINER